



Credit: Adapted from NASA/JPL Caltech

Three Puzzling Ice Age Mysteries

1. Sudden return of Ice Age temperatures 12,800 years ago

- ✓ After about 1400 years of warming, temperatures plunged 10°C (50°F)
- ✓ That abrupt change is called the Younger Dryas (YD) cooling episode
- ✓ It is the most unusual cooling event in about 2 million years

2. Extinction of large animals, called 'megafauna'

- ✓ 10s of millions animals went extinct in a short time
- ✓ Mammoths, mastodons, and saber-toothed tigers disappeared
- ✓ The last similar event was more than 3.5 million years ago

3. Sudden, major change in the Clovis culture

- ✓ The use of distinctive Clovis spear points suddenly stopped
- ✓ Human population levels plunged by about 30 to 60%

All three occurred about 12,800 years ago. Can that be coincidental?

NOTE: this website is a brief, non-technical introduction to the YDB impact hypothesis. For in-depth information, go to "Publications" to find links to detailed scientific papers.

Has it happened before?

66 million years ago, a giant asteroid or comet hit Mexico

Just as 12,800 years ago, that impact:

- caused massive extinctions (dinosaurs)
- created tons of melted spherules and glass
- loaded the atmosphere with soot and dust
- radically changed the climate

The comet that hit Earth 12,800 years ago was smaller than the dinosaur-killer



Credit: NASA/JPL Caltech

Details of the Younger Dryas Impact

About 12,800 years ago, a giant broken-up comet

- caused airbursts or craters across Northern Hemisphere
- deposited melted material in the Younger Dryas boundary (YDB) layer
(Note that the abbreviation “YDB” is used often on this website)
- melted parts of huge northern ice sheets covering Canada and Europe
- halted circulation of massive amounts of ocean water in North Atlantic
- triggered 1,100-year-long climatic cooling, called the Younger Dryas
- contributed to the extinction of millions of large animals (megafauna)
- caused a major decline in human population levels of approx. 50%

Evidence

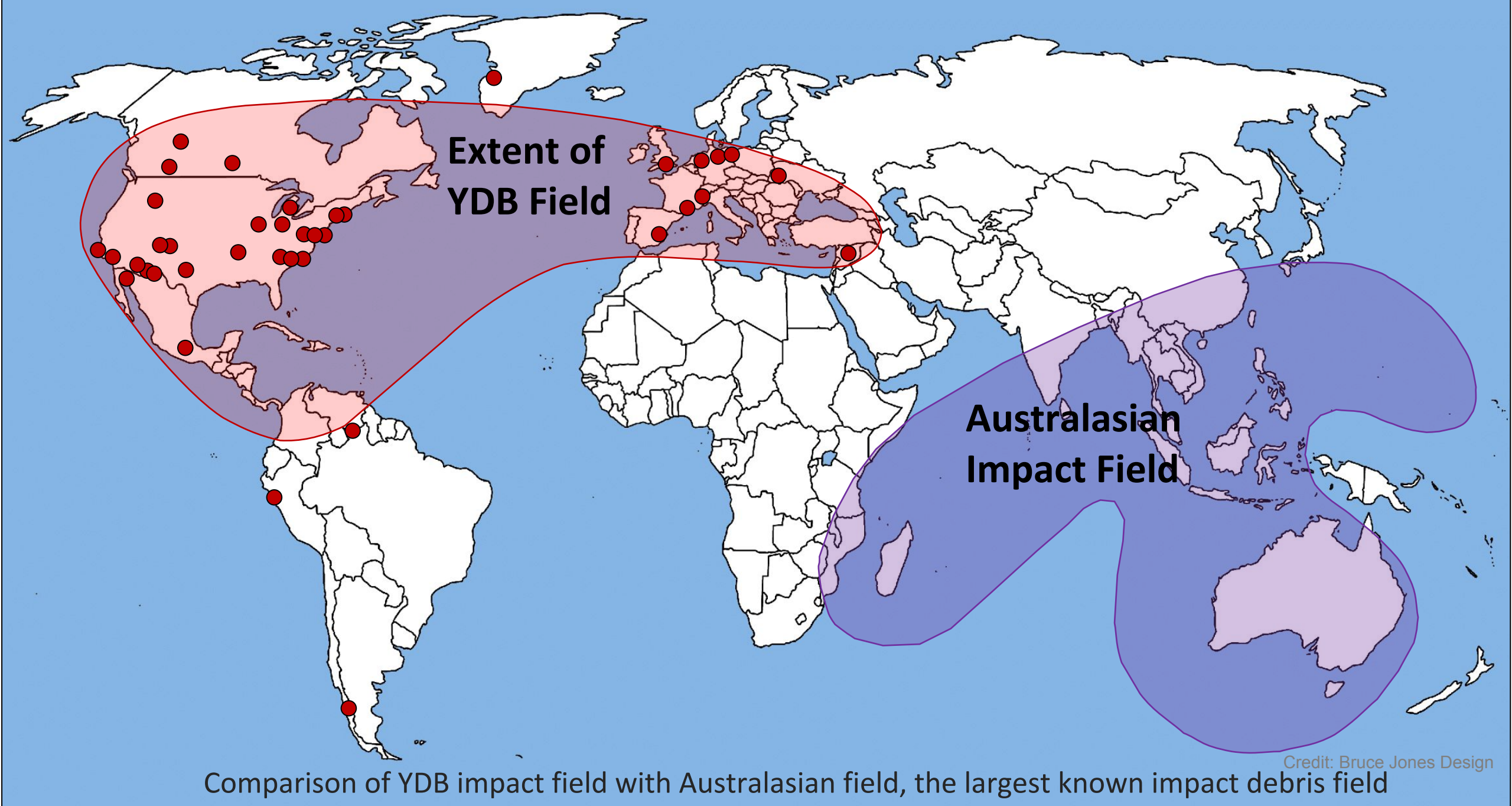
The following impact materials reach major peaks in the
Younger Dryas boundary (YDB) layer
Each is discussed in detail in later sections of this website

- ✓ Magnetic, iron-rich spherules
- ✓ Glassy, silica-rich spherules
- ✓ High-temperature meltglass
- ✓ Nanodiamonds
- ✓ Soot (aciniform carbon)
- ✓ Fullerenes containing helium-3

Extent of Evidence

Millions of tons of material, melted at high temperatures,

- ✓ is at more than 36 known sites
- ✓ is at every site currently investigated
- ✓ is spread across 16 countries on 4 continents
- ✓ ranges from offshore California to the Middle East
- ✓ has no geographical limit to the extent of distribution
- ✓ covers 20-25% of the N. Hemisphere (map on next slide)
- ✓ dates to approximately 12,800 years ago at the start of YD cooling



Sample site with impact-related materials



Murray Springs, AZ

CLOVIS-ERA PEAKS:

✓ Black mat (12,800 yrs)



Murray Springs, AZ

CLOVIS-ERA PEAKS:

Peaks in impact-related items are in or just below black mat layer with none or few above it



- ✓ Mammoth skeletons
- ✓ Black mat (12,800 yrs)

Murray Springs, AZ

CLOVIS-ERA PEAKS:



✓ Clovis points

✓ Mammoth skeletons

✓ Black mat (12,800 yrs)

All items reach peaks in or just under the black mat, and none peak above it



Murray Springs, AZ

CLOVIS-ERA PEAKS:

- ✓ Melted spherules
- ✓ Meltglass
- ✓ Iridium (as dinosaurs)
- ✓ Fullerenes w/ He-3
- ✓ Nanodiamonds
- ✓ Clovis points
- ✓ Mammoth skeletons
- ✓ Black mat (12,800 yrs)

Evidence shows that a catastrophic impact occurred 12,800 years ago

But why should we care?

Because ...

- More will hit us in the future
- They often cause giant tsunamis
- They can change climate suddenly
- They can trigger widespread wildfires
- Even small impacts can obliterate a city
- They can cause extinctions, including ours

Mammoths and dinosaurs couldn't stop the comets ... but we can.